



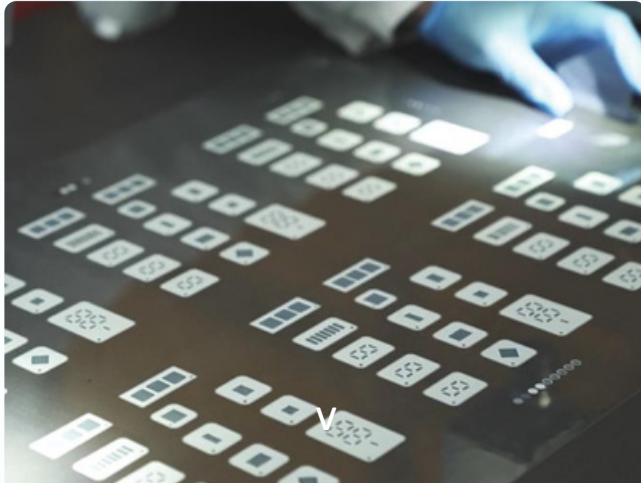
THE MORE COST-EFFECTIVE E-PAPER OPTION

Printed E-paper Displays & Solutions

- ✓ Cost-Effective
- ✓ Ultra Low Power
- ✓ Thin & Flexible



Crystal Display Systems Ltd



Almada, Portugal
Prototyping & Consulting Services
Sheet-to-sheet production
Electronics & Product Design



Linköping, Sweden
Roll-to-roll Upscaling Services
Printed Electronics Contract
Manufacturing Services



Freiburg, Germany
R&D Services
Inks and materials
Testing and validation

We produce ultra-low-power printed e-paper displays tailored to your needs.

Experts in printed electronics and mass-producers of customized displays based on innovative electrochromic technology, unlike LCD, LED, or E INK®



Electrochromic



Reflective



Segments & Icons



Moisture Barrier Substrate

Graphical layer

Electrochromic layer

Symbol layer

Electrolyte

Counter Electrode

Silver

Moisture Barrier Sealing

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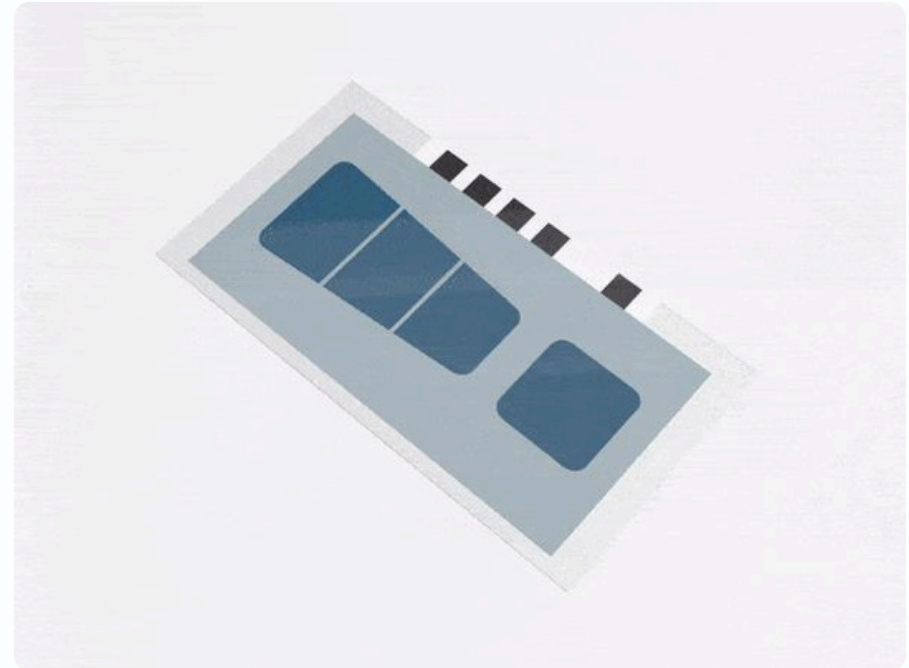
Electrochromic



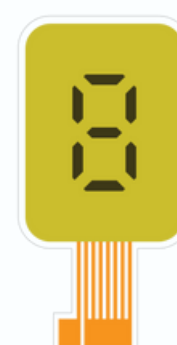
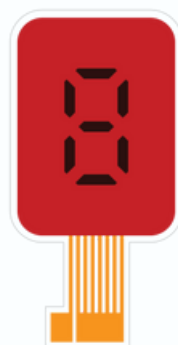
Reflective

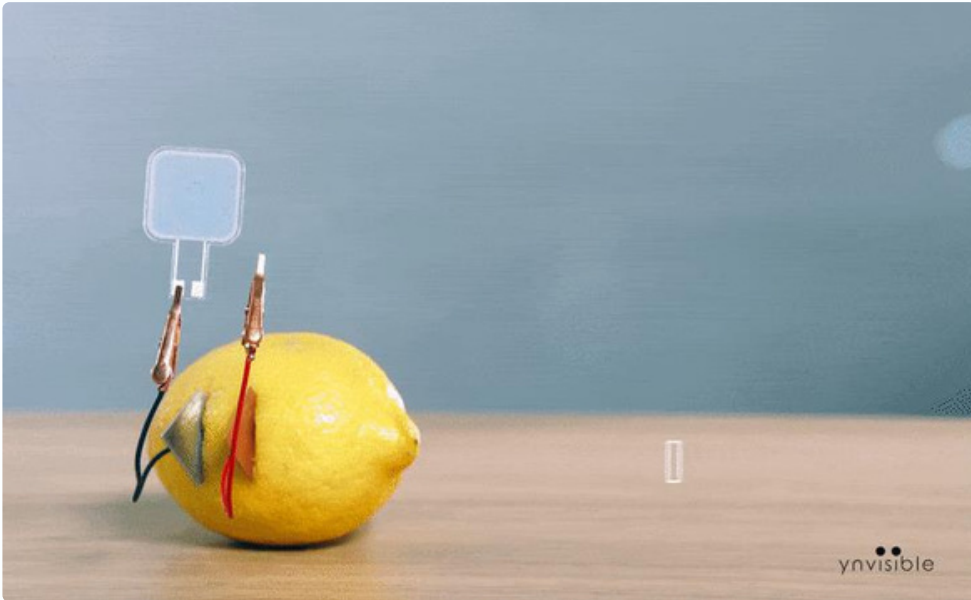


Segments & Icons



Available In Your Preferred Color





Most energy-efficient printed displays on the market

Ideal display for battery-driven or battery-less IoT devices.



Microwatt
< 1 $\mu\text{W}/\text{cm}^2$



Image Memory
without power



Low Voltage
1.5V – 3V

Thin & flexible with endless design freedom

Experiment with different shapes, forms, and colors.



Thin
< 300µm



Flexible
10 mm radius



Customizable
Colors & shapes



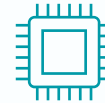


Cost-effective production and integration

Use CDS displays to reduce both system and component cost



Cost Savings
Competitive pricing



Easy to Drive
No extra components



Easy to Integrate
ZIF, ACF, or Glue

Eco-friendly & sustainable display solution

Reusable, no energy-hungry vacuum deposition, non-ITO, non-toxic with low carbon footprint.



Less E-Waste

Low metal consumption



Non-Toxic

No toxic and rare earth materials



Reusable

Unlike static paper labels and signs



The CDS E-Paper is the Most Sustainable Display Option



CDS E-Paper Display



Reflective LCD

Key Materials

PET-plastic
Water-based inks

Glass & ITO
Metals

Production Method

Screen-printing
No clean room required

Vacuum & chemical vapor deposition
C2I,e7a gnr aromosm required

Weight

7x lighter (0.46 grams)

3.23 grams (+700%)

Weight Carbon Footprint CO₂-equivalents

255x less CO₂(0.795mg)

203mg CO₂-equivalents (+25500%)

Mineral Resource Scarcity Cu-equivalents

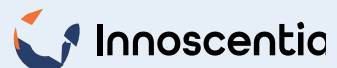
145x less(9.93μg)

145 Cu-equivalents (+14500%)

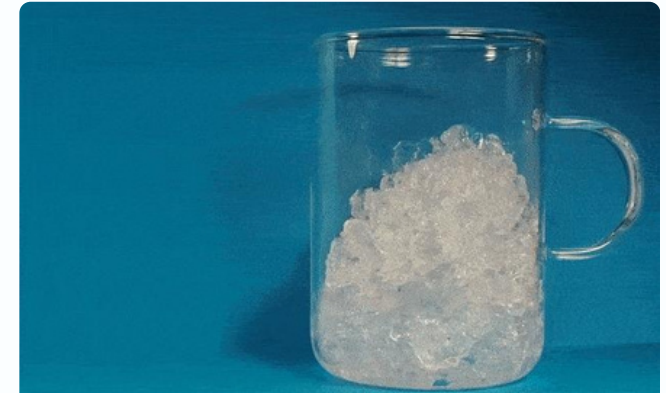
Endless Design Flexibility Enables New Applications



Smart Expiry Date Label



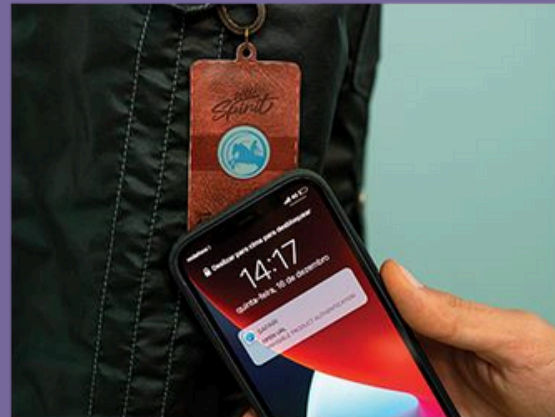
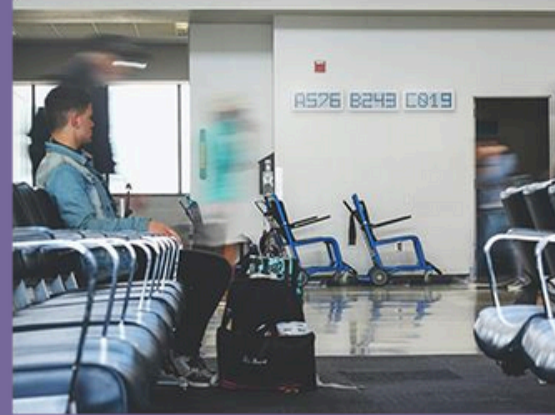
Visual Interface For
Cleantech



Intuitive Interface for
Cold-chain Monitoring

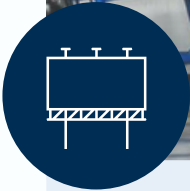
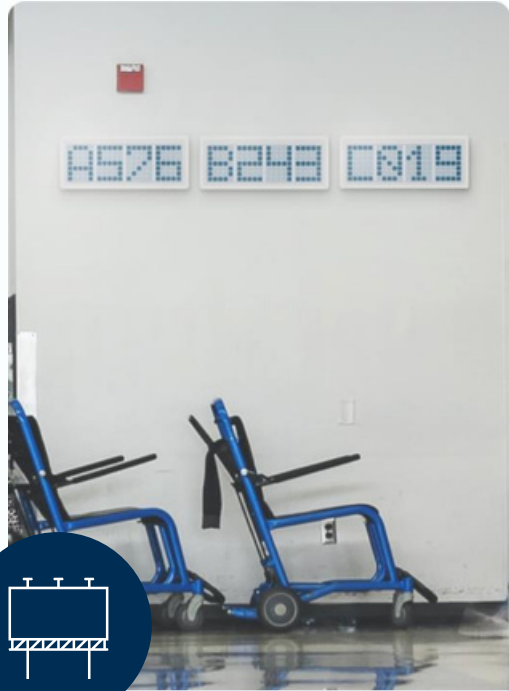


Target Markets and Solutions



Target Markets

Endless Design Flexibility Enables New Applications



DIGITAL
SIGNAGE



AUTHENTICITY &
SECURITY



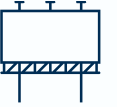
SMART MONITORING
LABELS



RETAIL LABELS &
SIGNAGE

Digital Signage

Both Indoor and Outdoor Applications



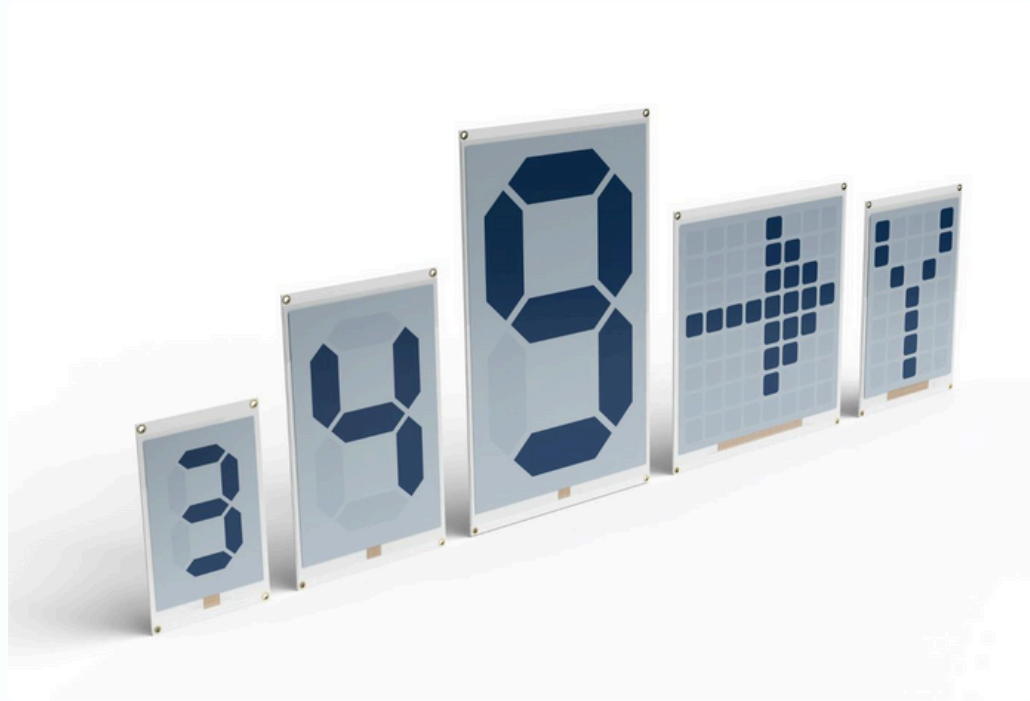
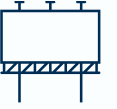
DIGIT AND ALPHANUMERIC



DOT MATRIX

Digital Signage

Both Indoor and Outdoor Applications



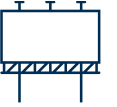
STANDARD MODULES



CUSTOM SOLUTIONS

Digital Signage

Public Information Displays



Queue Management



Passenger Information Display

Smart Monitoring Labels

Thin, Flexible, and Ultra-low-power Visual Indicator for Smart Labels



Logistics & Cold-chain Monitoring

Cheaper, thinner, and more intuitive way to measure, log, and visualize the cold-chain journey of temperature-sensitive products such as pharmaceuticals, biologics, food and beverages.



Smart Expiry Date Labels

Dynamic shelf-life labelling to reduce food waste, avoid expired chemicals and inks, and to visualize inventory status.



Industry 4.0 Visualization

Visualize predictive maintenance on tools and equipment, track and trace internal value-chain, automatic and visual quality checkpoints.

Authenticity And Security

Combat Counterfeit Goods and Enhance User Experience



Battery-less, thin & flexible NFC labels with Ynvisible's Display



With an NFC-enabled device, customers scan the label to authenticate.



Customers can continue to engage with your brand online.



The display activates using energy harvested via NFC.

Authenticity And Security

Combat Counterfeit Goods and Enhance User Experience



Push to authenticate

- Self-powered
- Battery-less
- Almost impossible to copy
- No external reader needed

Authenticity And Security

Combat Counterfeit Goods and Enhance User Experience



Authenticate with secure reader

- Battery-less
- Almost impossible to copy
- Two-step authentication with external reader



Retail Signage And Labels

With CDS's Ultra-low-power and Cost-effective E-paper Technology

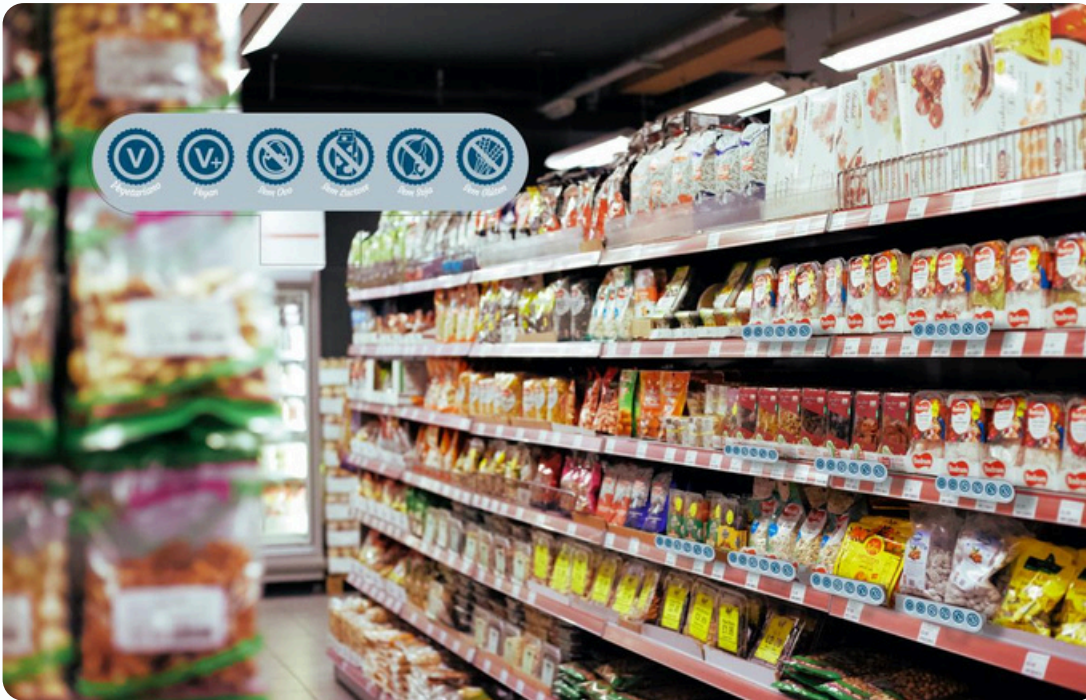


Large format price signs

- Ultra-low-power
- The more effective display choice
- Easy to drive and integrate
- Wide viewing angle

Retail Signage And Labels

With CDS's Ultra-low-power and Cost-effective E-paper Technology



PRODUCT INFORMATION



ELECTRONIC SHELF TALKERS

Retail Signage And Labels

With CDS's Ultra-low-power and Cost-effective E-paper Technology



Digital Price Tags

- Real time pricing on each item
- Thin & flexible labels
- Highly customizable



Next Generation Applications



TEMPERATURE THRESHOLD
BREACHED



PLATELETS

CAUTION: FOR FURTHER
MANUFACTURING USE AS A
COMPONENT OF A MEDICAL
DEVICE FOR WHICH THERE ARE
NO ALTERNATIVE SOURCES

Approx 500ml Whole Blood
Store at less than 10 °C

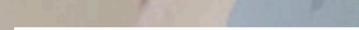
 HEART CARE
PRIVATE HOSPITAL

Intelligent Wearable Patches & Labels

For Medical, Sports and Quantified Self

- ✓ Intuitive and Non-Invasive Visual Interface
- ✓ Thin, Flexible, Disposable
- ✓ Versatile Technology Platform

WOUND OK!



Battery-less Authenticity Label

NFC Energy Harvesting Brand Protection Label

- ☑ **Proprietary Printed E-Paper Display**
Secure Solution
- ☑ **Battery-Less & Ultra Low Power**
Using NFC Energy Harvesting
- ☑ **Highly Customizable**
Custom Display Icon & Graphical Overprint



Decoration and Interactive Surfaces

With Ynvisible's Ultra-low-power and Cost-effective E-paper Technology



Posters and Art



Large Format Interior Design

Self-Powered Interactive Wall Art

Touch interface with Graphic Print and Dynamic Electrochromic Print

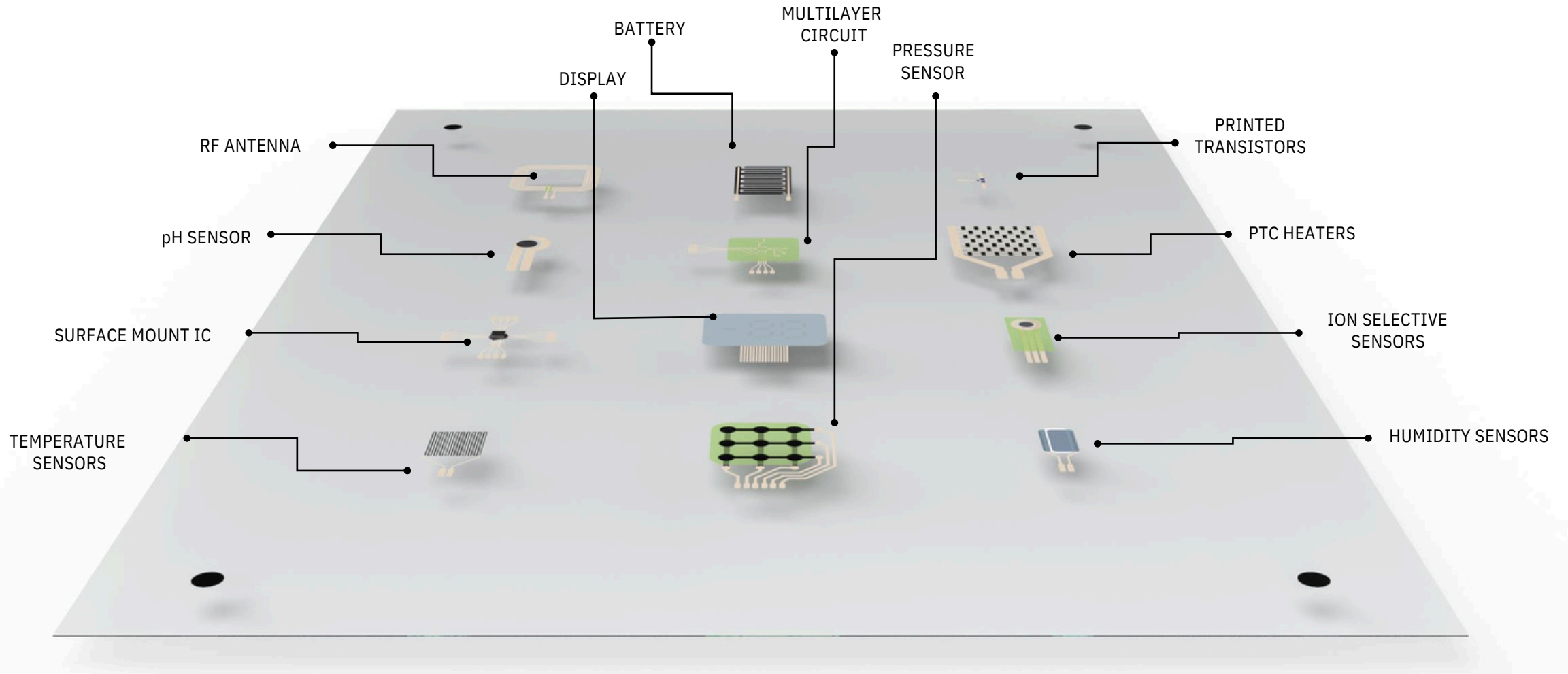
- ☑ **Graphic Ink & Dynamic Ink**
Electrochromic sections
- ☑ **Energy Autonomous**
Powered by indoor light energy harvesting
- ☑ **Touch Interface**
Printed Capacitive Touch



Source: Research Institutes of Sweden AB

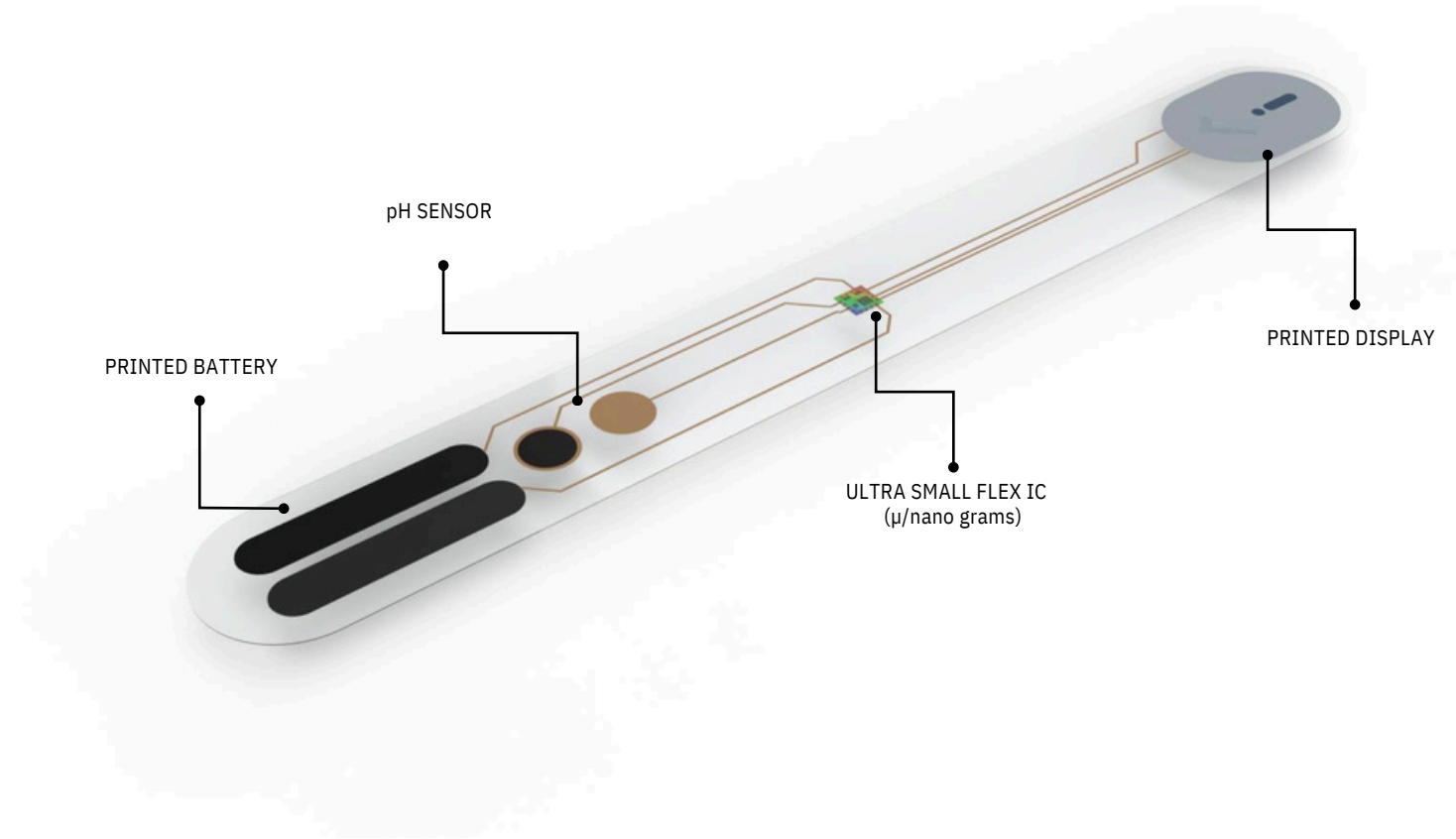
Ynvisible's Printed Electronics Component Portfolio

Sensing, Communicating, Powering, Computing



CASE STUDY: VISUALIZING URINARY TRACT INFECTION

LOW-COST, SINGLE-USE, PRINTED, THIN & FLEXIBLE



Smart Pharma Packages

Drug Adherence and Quality Assurance



Temperature Tracking

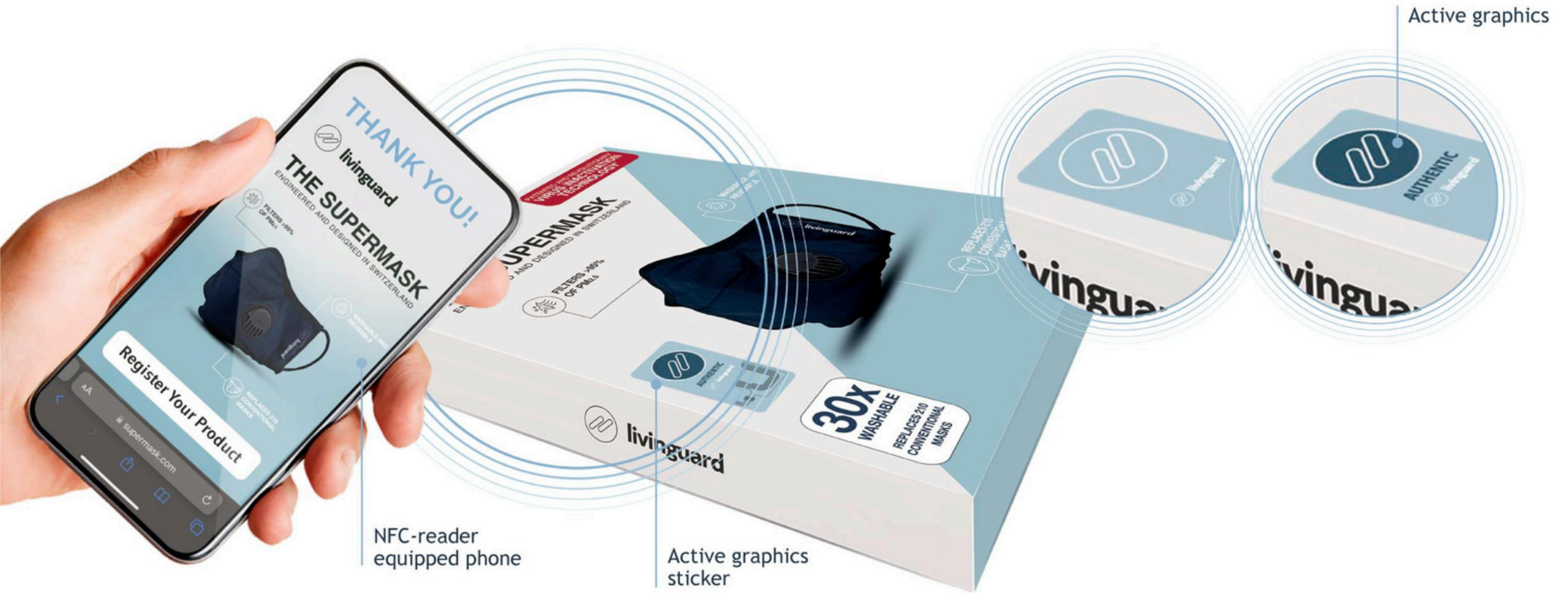
Active graphics



Timer Reset Button

Smart Packaging

Product Information, User Engagement



Smart Cards

Dynamic Cvc/Cvv and Other Visual Feedback



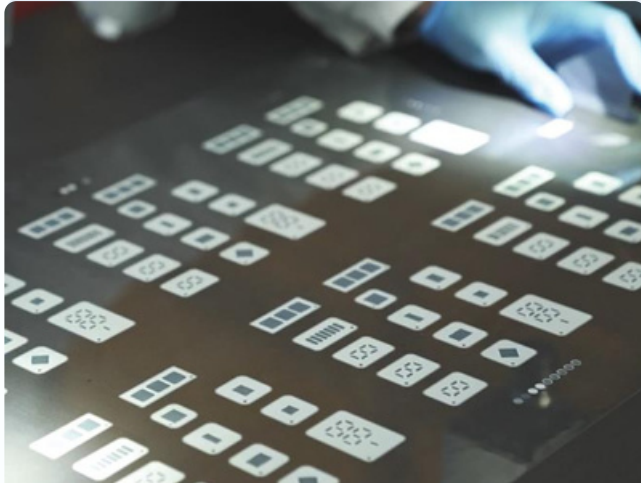
Services

From Idea to Mass Production



Services

From idea to mass production



Prototype Production

Rapid and cost-effective prototype production with your customized display design



Volume Production

Mass production of printed displays and contract

manufacturing services



R&D and Solutions

Display development, printed and hybrid electronics, and product solution development.

Prototype Production

Rapid and Cost-effective Displays with Your Design



RAPID PROTOTYPING

From sketch to delivery in a few weeks



COST EFFECTIVE

Fixed fee of 3.500 EUR for customized display prototypes



DESIGN SUPPORT

We help you throughout the entire design process



Volume Production

Displays Mass Production & Printed Electronics Manufacturing Services



PRINTING

Versatile printing and coating equipment



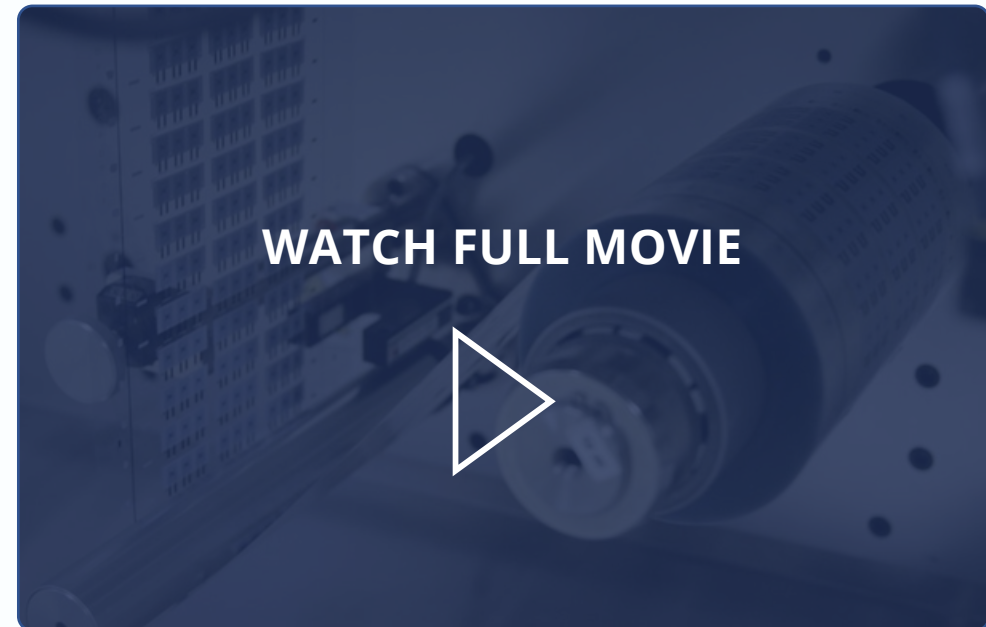
CONVERSION

Slitting, cutting, and lamination



QUALITY ASSURANCE

Automated electrical and optical testing



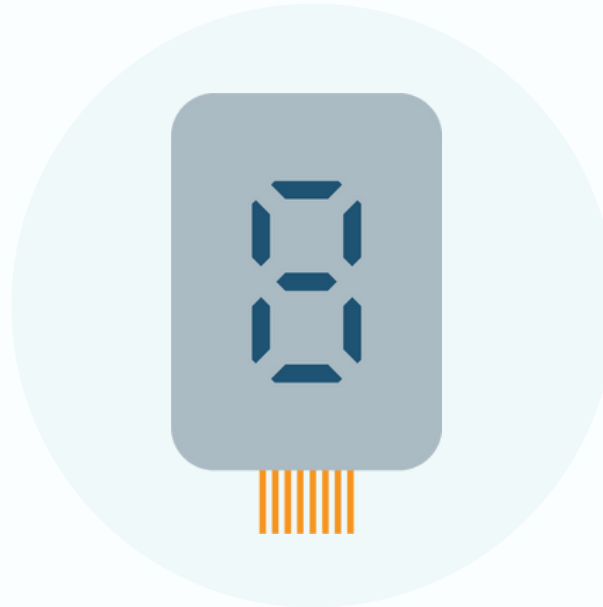
R&D and Full Product Solutions Development

Product development, Proof-of-concepts, Printed Systems

DISPLAY R&D

OPTIMIZATION OF YNVISIBLE'S DISPLAY

SHAPES & COLORS
TOUCH INTERFACE
DRIVER ELECTRONICS
LOW VOLTAGE
IRREVERSIBLE DISPLAYS



DISPLAY+

SOLUTION DEVELOPMENT WITH PARTNERS



PRINTED SENSORS
SUSTAINABLE BATTERIES
ENERGY HARVESTING
WIRELESS COMMUNICATION
SOLUTION DEVELOPMENT

Evaluation Kits

Get Started Today – Kits Available In Our Online Store



Segment E-paper Display Kit

85 EUR



Designer Kit

190 EUR

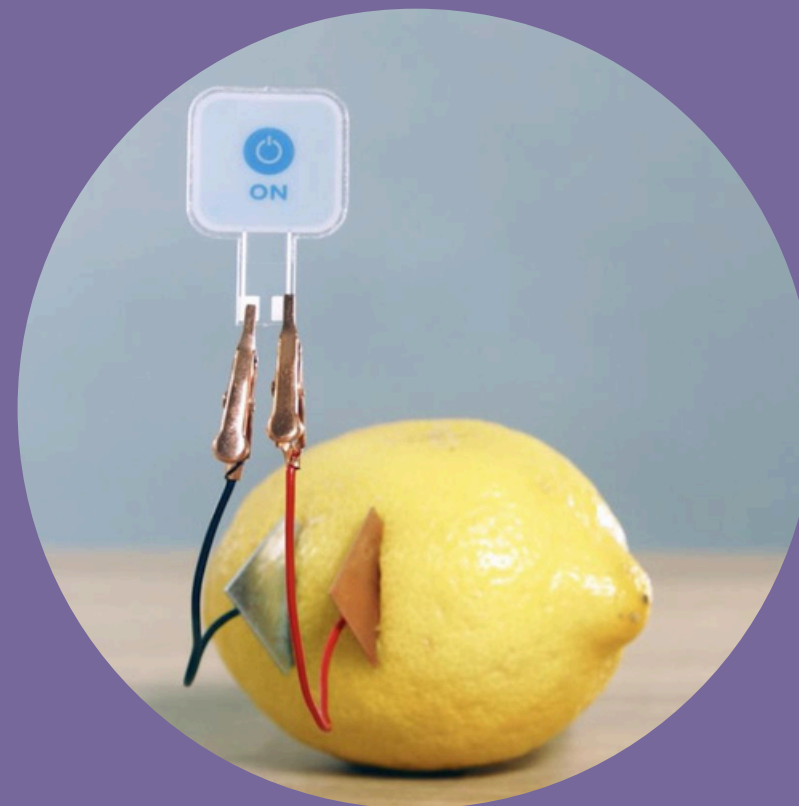
CDS

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THE MORE COST-EFFECTIVE E-PAPER OPTION

✓ Cost-Effective ✓ Ultra Low Power ✓ Thin & Flexible

www.crystal-display.com